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Research Article

Health Literacy and Oral Oncology study on the HPV Risk Factor in a Portuguese University

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Abstract

Health literacy covers a wide range of skills, including reading, writing, numeracy, listening, speaking, and critical thinking. It empowers individuals to access and understand health information. The concept reveals crucial significance in the field of oral cancer. The aim of this study was to assess the health literacy level of Portuguese university students regarding Human Papilloma Virus (HPV) infection and their knowledge of oral cancer risk factors. Additionally, we aimed to determine the prevalence of HPV in the oral cavity among the student population and examine the significance of health literacy in promoting good practices and preventing oral cancer. A convenience sampling method was employed, and the sample consisted of 108 female participants aged between 18 and 37 years. A validated questionnaire was used to assess HPV knowledge, employing both item response theory and classical test theory. Salivary samples were collected using a swab for HPV prevalence determination, and DNA extraction was performed after storing the samples at -20˚C. Compared to other university populations, the vaccination rate observed in this study was higher. The study also revealed a low prevalence of HPV among the participants, indicating the potential effectiveness of the immunization strategy implemented in Portugal. However, a considerable proportion of students demonstrated a lack of awareness regarding the association between sexual practices and the risk of HPV transmission, as well as the potential transmission of HPV through saliva. Moreover, the students surveyed displayed limited knowledge about the risk factors for oral cancer. The results of this study provide valuable insights into previously unknown aspects and erroneous preconceptions. Utilizing this information, intervention strategies can be tailored to effectively transmit the necessary knowledge and promote greater awareness in the population.

Keywords: Health literacy; Oral cancer; Human papilloma virus (HPV); Risk factors; University students; Vaccination

Introduction

Health literacy: university students in focus

The concept of "health literacy" originated in the 1970s, particularly in 1974, and has since become a fundamental aspect of Public Health. Health literacy, as defined by the World Health Organization (WHO) [1], encompasses "a set of cognitive and social skills that enable individuals to access, comprehend, and utilize information for the promotion and maintenance of good health". It involves making changes in personal lifestyles and living conditions, as well as implementing actions aimed at enhancing individual and collective health, including the formulation of appropriate health policies. Health literacy covers a wide range of abilities, including reading, writing, numeracy, listening, speaking, and critical thinking. It empowers individuals to access

and understand health information effectively, enabling them to make informed decisions and take appropriate actions concerning their health [1,2].

Health literacy extends beyond an individual's personal skills and knowledge to encompass the intricate nature of the healthcare system and the clarity and accessibility of health-related information and services. It entails the ability to navigate healthcare settings, comprehend medical terminology, interpret medication instructions, critically evaluate health information, and actively engage in meaningful discussions with healthcare providers. Digital approaches can be employed to simplify or enhance the understanding of health concepts, with the use of eHealth devices assisting patients in comprehending complex information. However, it is crucial to acknowledge that new technologies may contribute to the emergence of disparities, considering the unequal access to digital health services [3-5].

Health literacy is widely recognized as a critical factor influencing health outcomes and has a substantial impact on promoting health equity and mitigating health disparities [5].

The WHO places significant emphasis on enhancing health literacy at both the individual and population levels. This involves implementing a range of strategies, including improving the clarity and accessibility of health information, enhancing the communication skills of healthcare providers, and promoting educational programs and policies that empower individuals to make informed decisions about their health [1].

Higher levels of health literacy have been associated with improved prevention efforts, increased health promotion, enhanced engagement with health determinants, greater decision-making autonomy, heightened awareness and control over individual and collective health, reduced hospitalizations, and decreased premature mortality rates for both individuals and their communities. Overall, health literacy optimization contributes to an improved biopsychosocial status and enhances Health-Related Quality of Life [6,7].

In Portugal, 61% of the surveyed population exhibits problematic or inadequate levels of general health literacy, surpassing the average of 49.2% observed across the nine countries studied. This disparity highlights the pressing need to address health literacy issues in the Portuguese population. An inadequate level of health literacy can have substantial implications for health outcomes and must be effectively addressed to promote better health and well-being [5,8].

However, it is important to note that the university population, despite having better access to important resources, is not immune to health literacy challenges. Studies have shown concerning results regarding health literacy levels among students, even within the field of Health Sciences. For instance, a study by Runk (2016) involving 1st-year students of Economics and Management revealed that 92.7% of them had less than sufficient health literacy, with only 7% demonstrating adequate health literacy and a mere 0.4% exhibiting excellent health literacy [9]. Similarly, Evans (2019) found that 54.6% of students had a limited level of health literacy [10]. In another study conducted by Ozen (2019) among university students in the Health Sciences field, 29.0% displayed insufficient health literacy, and 29.3% had a limited level [11]. Furthermore, Kvan's research highlighted the key health concerns among university students, including physical exercise (25.5%), prevention of gender violence (26%), sexually transmitted diseases (21.3%), with particular emphasis on human immunodeficiency virus (18.9%), pregnancy prevention (13.5%), prevention of alcohol and other drugs (20%), nutrition and eating behaviors (16.6%), accident prevention (9.1%), and suicide prevention (3.4%). Internet sources have emerged as one of the primary sources of health information for students, sometimes even surpassing health professionals and family members [9-12].

Oral Cancer: HPV in focus

Oral cancer ranks among the top 10 most prevalent types of cancer on a global scale. It stands as the sixth most commonly diagnosed cancer worldwide, comprising around 3% of all cancer cases. In 2020 alone, it is estimated that there were approximately 377,713 new cases of oral cancer. Tragically, the number of deaths attributed to oral cancer in the same year reached approximately 177,757 [13-15].

Regional Disparities in Oral Cancer Incidence and Mortality

The incidence and mortality rates of oral cancer exhibit notable regional variations. Specifically, higher rates are commonly observed in certain regions of Asia, particularly South East and South Central Asia. Eastern European countries have consistently reported higher rates of oral cancer in comparison to their Western European counterparts [16,17].

Squamous Cell Carcinoma: The Predominant Histological Type

Squamous cell carcinoma (SCC) stands as the most prevalent histological type among oral cancer cases, accounting for over 90% of all diagnosed instances. SCC originates from the squamous cells that line various regions of the oral cavity, including the lips, tongue, gums, and the lining of the cheeks and floor of the mouth [13,17,18].

Risk Factors Associated with Squamous Cell Carcinoma

SCC is strongly associated with certain risk factors, including tobacco use (both smoking and smokeless tobacco) and excessive alcohol consumption. Additionally, other factors such as biological risk factors, betel quid chewing, poor oral hygiene and oral microbiota, periodontitis, as well as specific genetic and environmental factors, may also contribute to the development of

SCC [19-22].

Less Common Histological Types of Oral Cancer

In addition to SCC, which is the prevailing histological type in oral cancer cases, there are several other less common types worth mentioning. These include verrucous carcinoma, adenoid cystic carcinoma, mucoepidermoid carcinoma, and various others [23,24].

The incidence of HPV-related oral cancer has shown a notable increase in various countries, particularly in Western regions, during the past few decades. HPV has emerged as an increasingly recognized factor in the development of oral malignancies, accounting for approximately 5% of all malignant tumors. This rise is attributed to shifting sexual behaviors and the prevalence of high-risk HPV infections. In relation to head and neck SCC, HPV is associated with an elevated risk. Among the HPV subtypes, certain types are categorized as high-risk, including HPV 16 and HPV 18, while others are considered low-risk, such as HPV 6 and HPV 11. HPV 16 is the predominant subtype detected in the oral mucosa and has been strongly associated with a group of oncological pathologies, potentially increasing the risk of developing cancers affecting the floor of the mouth, gums, tongue, and palate [21,25].

Despite substantial efforts, investments, advancements in diagnostic approaches, the implementation of early intervention programs, and the emergence of more precise, efficacious, and less invasive treatments, the global 5-year overall survival rate has stagnated at around 50% over the past three decades. This persistent rate underscores the challenges faced in effectively combating the disease and achieving significant improvements in long-term outcomes [26,27].

Objectives

- To assess the level of health literacy among students of Fernando Pessoa University (Porto, Portugal) with regards to HPV infection and knowledge of risk factors associated with oral cancer.
- To determine the prevalence of HPV in the oral cavity of the student population.
- To examine the significance of health literacy in promoting the acquisition of good practices and preventing oral cancer.

Materials and Methods

A comprehensive literature review was conducted, focusing primarily on articles published between 2018 and 2023, as well as relevant literary works. The search was performed using online databases such as PubMed, Google Scholar, and SciELO, as well as the library of the Fernando Pessoa University (UFP) - Faculty of Health Sciences. The keywords used in the search included HPV, oral cancer, vaccination, and risk factors. Articles that closely aligned with the study's theme and were primarily written in English were included based on predefined inclusion criteria.

This study was conducted with the approval of the Ethics Committee of Fernando Pessoa University, and all necessary ethical considerations were followed. All participants provided informed consent prior to their involvement in the study.

Sample and Questionnaire Completion

The study utilized a convenience sampling method, and the sample consisted of 108 female participants aged between 18 and 37 years old. Students were invited to participate. Students were informed of the nature of the study and provided with an information sheet. Surveys were distributed during classes. Participation in the survey was anonymous, and voluntary. Other information (i.e., age, marital status and HPV vaccination status), was also collected.

For the completion of the questionnaires, an adapted version of the questionnaire developed by Waller, J. et al. (2012) was utilized [28]. This questionnaire aimed to assess knowledge about HPV and was validated using both item response theory and classical test theory. The questionnaire primarily consisted of closed-response questions, with some open-ended questions included as well.

Salivary Sampling

Salivary collection was conducted using a swab as a sampling tool. The procedure was performed by trained volunteers who followed specific instructions. It involved gently scraping the oral mucosa in regions including the jugal mucosa, palate, floor of the mouth, vestibule, and tongue. After the scraping process, participants were requested to release any excess saliva into containers labeled with unique codes. This step aimed to collect cells that might have been dislodged and not retained on the swab.

Sample Processing

The collected samples were stored at -20 ˚C until processing. DNA extraction was performed using the commercially available QiAamp DNA Blood mini Kit (Qiagen, Hilden, Germany) following the manufacturer's instructions. To ensure the accuracy of the PCR reactions, both negative and positive controls were included. The negative control consisted of sterile double-distilled water (ddH2O) substituted for sample DNA. The positive control was obtained from a cervical scraping sample previously diagnosed with high-risk HPV using the hc2 High-Risk HPV DNA test kit (Qiagen, Hilden, Germany).

Statistical Treatment of Data

The variables of interest obtained from the completed questionnaires were transcribed and entered into SPSS for data

treatment and analysis. To adequately present the obtained data, tables with corresponding statistical information were utilized. Descriptive and inferential statistics were employed using SPSS-21.0 (Statistical Package for the Social Sciences) software.

Results

Sample characteristics

Demographic information of study participants is reported in Table 1. Out of the 108 participants, 79% were single, 14% were married, 6% lived in a consensual union partnership, and 2% were divorced. When asked about their HPV vaccination status, 68% self-reported having received the HPV vaccine (N = 73)

Variables	N (%)
Age (mean ± SD)	22.3 ±5.6
18-24 years	93 (88.1%)
25-29 years	12 (11.1%)
>30 years	3 (2.8%)
Marital status	
Single	85 (78.7%)
Married	15 (13.9%)
Consensual union partnership	6 (5.6%)
Divorced	2 (1.8%)
HPV vaccine	73 (67.6%)
[1]SD - standard deviation	

Table 1: Characteristics of study participants (N=108)

Risk factors assessment

The majority of participants (76/108, 70.4%) reported alcohol consumption. Among these individuals, a significant portion (60/76, 68.9%) stated that they consume alcohol less than once a month. Moreover, the consumption of alcohol was primarily observed in social contexts (71/76, 93.4%), and the majority reported consuming less than 2 glasses (61/76, 80.3%), as depicted in Figure 1.

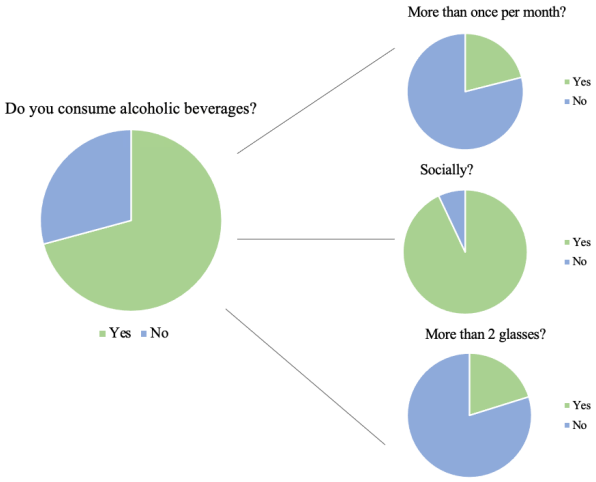

Figure 1: Characterization of alcohol consumption among study participants.

In terms of smoking habits, most participants (82/108, 75.9%) reported being non-smokers, as illustrated in Figure 2.

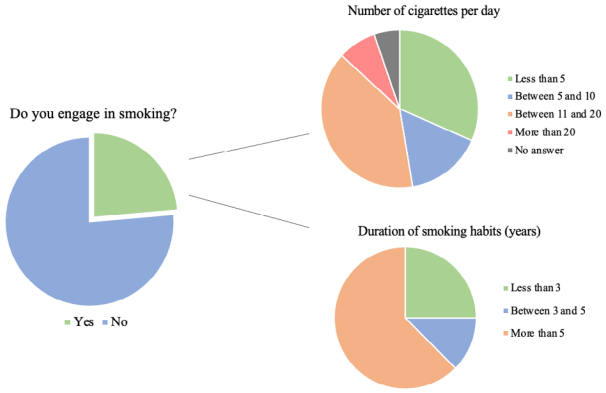

Figure 2: Characterization of smoking habits among study participants.

Regarding sexual behaviors, many participants reported engaging in oral sex, with some indicating occasional (52, 48.1%) or regular (14, 13.0%) practice. Figure 3 illustrates that the vast majority (49/66, 74.2%) started engaging in oral sex after the age of 18. Additionally, many of the students reported having had only one sexual partner throughout their lives (50/108, 46.3%), and the majority had one sexual partner in the last year (83/108, 76.9%).

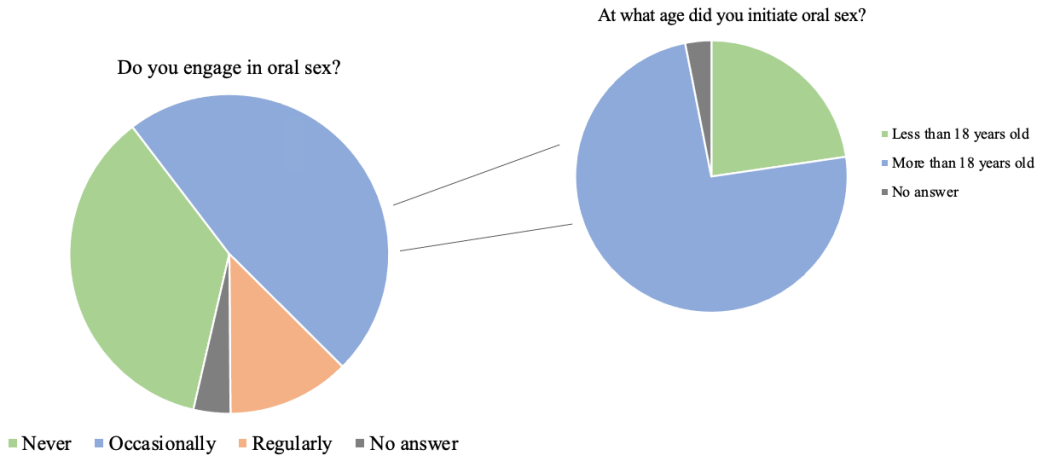

Figure 3: Characterization of the sample regarding sexual behavior: age at which oral sex was initiated.

Knowledge regarding HPV infection

Table 2 depicts the volunteers' knowledge regarding parameters associated with HPV.

	Wrong Answers N (%)
HPV infection presents visible symptoms or signs. (False)	38 (35.2%)
HPV is an infection that is primarily transmitted through sexual contact.	3 (2.8%)
HPV is one of the main sexually transmitted infection among young women.	13 (12.0%)
There are many subtypes of HPV.	4 (3.7%)
All HPV subtypes are oncogenic. (False)	10 (9.3%)
It is possible to screen HPV.	0 (0%)
HPV can cause HIV/AIDS.	13 (12.0%)
Engaging in sexual activity with multiple partners can elevate the risk of acquiring HPV infection.	0 (0%)
HPV is treatable with antibiotics. (False)	13 (12.0%)
It is possible for an individual to be a carrier of HPV without being aware of it.	1 (0.9%)
The statement "There are many subtypes of HPV" had the lowest response rate from students, with 4 out of 108 (3.7%) not providing an answer (data not shown).	

Table 2: Students' knowledge about HPV (N=108).

Figure 4 presents the findings of the participants' knowledge regarding HPV transmission.

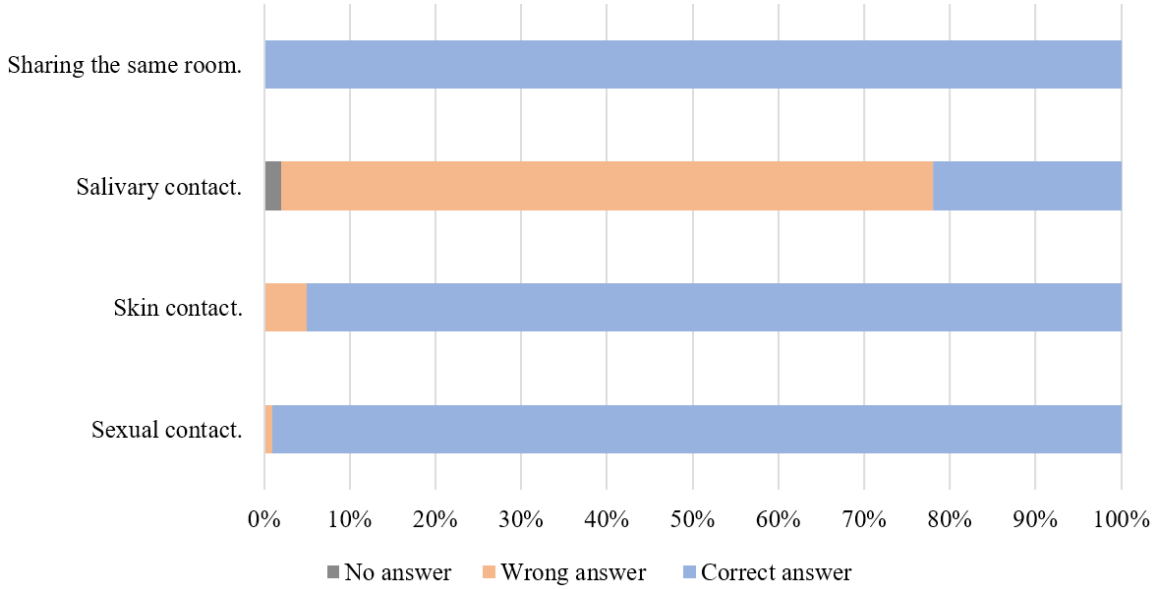

Figure 4: Bar chart illustrating the students' knowledge regarding HPV transmission.

It was observed that the concept of HPV transmission through "salivary contact" resulted in the highest number of errors among the participants (82/108, 75.9%).

Figure 5 depicts the knowledge expressed by the participants regarding the factors that contribute to the risk of HPV contamination.

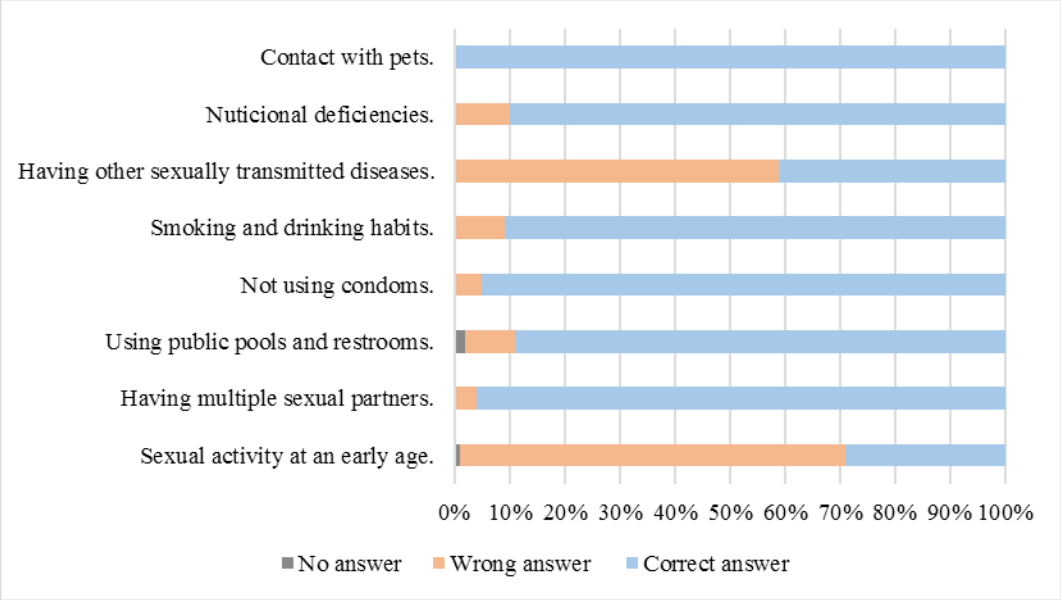

Figure 5: Bar chart illustrating the students' knowledge regarding the situations that increase the risk of HPV contamination.

"Sexual activity at an early age" was identified as the primary risk factor associated with the highest number of incorrect responses (76/108, 70.4%), followed by "Having other sexually transmitted diseases" (64/108, 53.9%).

Health literacy regarding oral cancer

Figure 6 presents the assessment of participants' ability to identify situations that are considered to increase the risk of oral cancer.

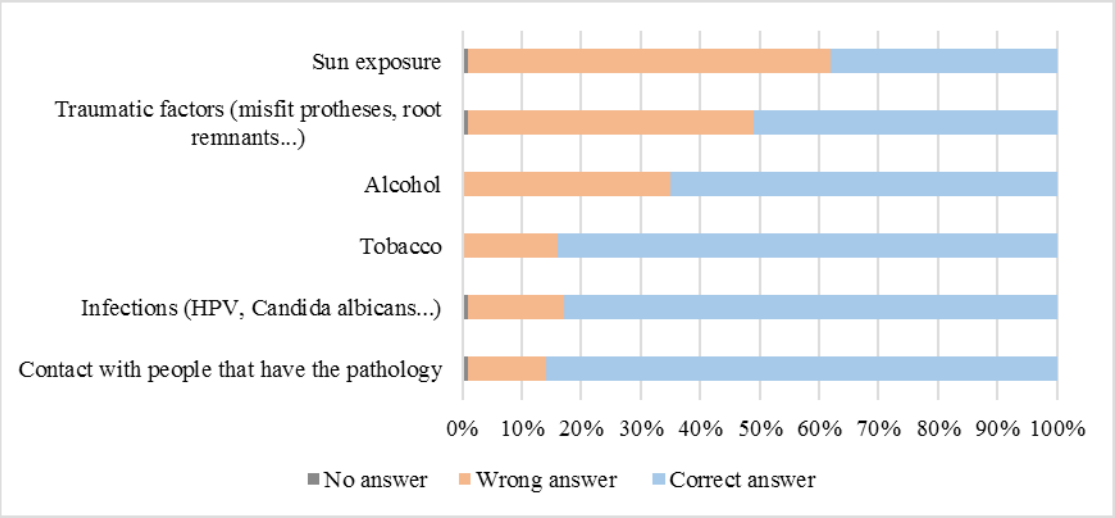

Figure 6: Bar chart depicting students' knowledge regarding situations associated with an increased risk of oral cancer.

Among the various factors evaluated as potential risk factors for oral cancer, the majority of students (66/108, 61.1%) did not recognize sun exposure as a significant contributor to the risk.

Table 3 provides a visual representation of the knowledge identified regarding the association between HPV and oral cancer.

	Wrong Answers N (%)
HPV does not cause oral cancer. (False)	9 (8.3%)
Chronic infections caused by HPV increase the risk of oral cancer.	4 (3.7%)
Subtypes 16 and 18 are the most frequently related to the oral carcinogenesis process.	5 (4.6%)
A carrier of HPV will definitely develop oral cancer. (False)	9 (8.3%)
The site mainly affected by oral cancer with HPV etiology is the tongue. (False)	45 (41.7%)
Oral cavity cancer is the second most common cancer associated with HPV, preceded by cervical cancer.	11 (10.2%)
Oral cancer with HPV etiology affects more women than men. (False)	93 (86.1%)
If diagnosed early, HPV may not lead to oral cancer.	10 (9.3%)
Oral cancer caused by HPV does not show visible signs. (False)	14 (13.0%)
The fact of having a sexual partner carrying HPV virus necessarily means the development of oral cancer. (False)	9 (8.3%)

Table 3: Students' knowledge about the relationship between HPV and oral cancer. (N=108)

It was observed that a significant proportion of the university students in the sample held the misconception that "Oral cancer with HPV etiology affects more women than men".

Furthermore, the majority of respondents expressed their belief in the feasibility of self-examining the oral cavity at home (96/108, 88.9%) – data not presented. These students identified the sites highlighted in Figure 7 as the most significant areas for examination.

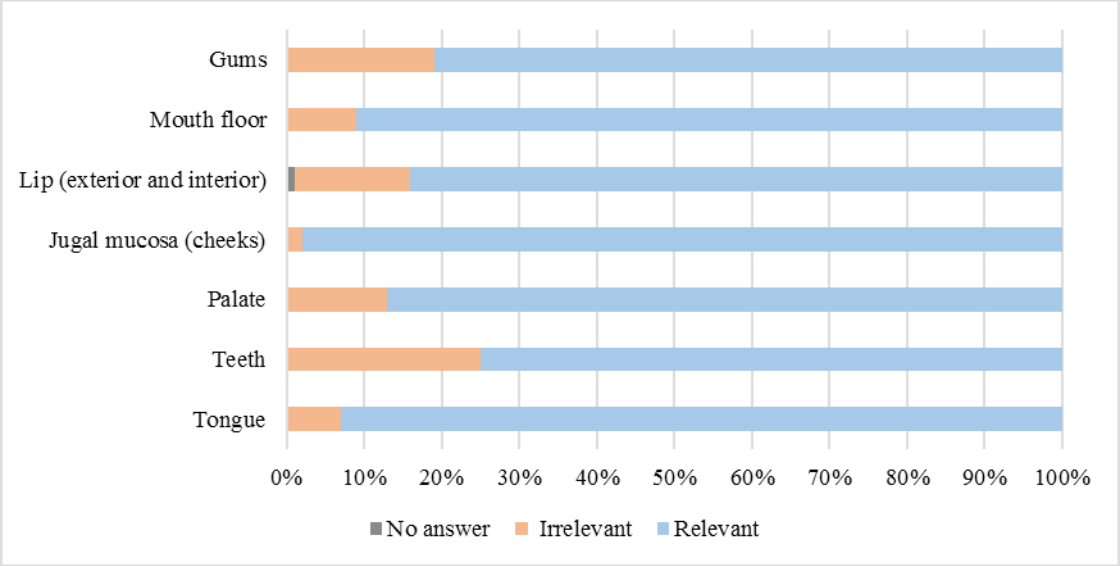

Figure 7: Bar chart illustrating students' awareness of the specific regions of the oral cavity considered important for self-examination.

A considerable number of students (24/96, 25.0%) did not recognize teeth as a significant region of the oral cavity to observe, while a similar proportion (18/96, 18.8%) did not consider gums as relevant.

Figure 8 illustrates the specific oral cavity lesions that university students associate with oral cancer and would prompt them to seek dental consultation.

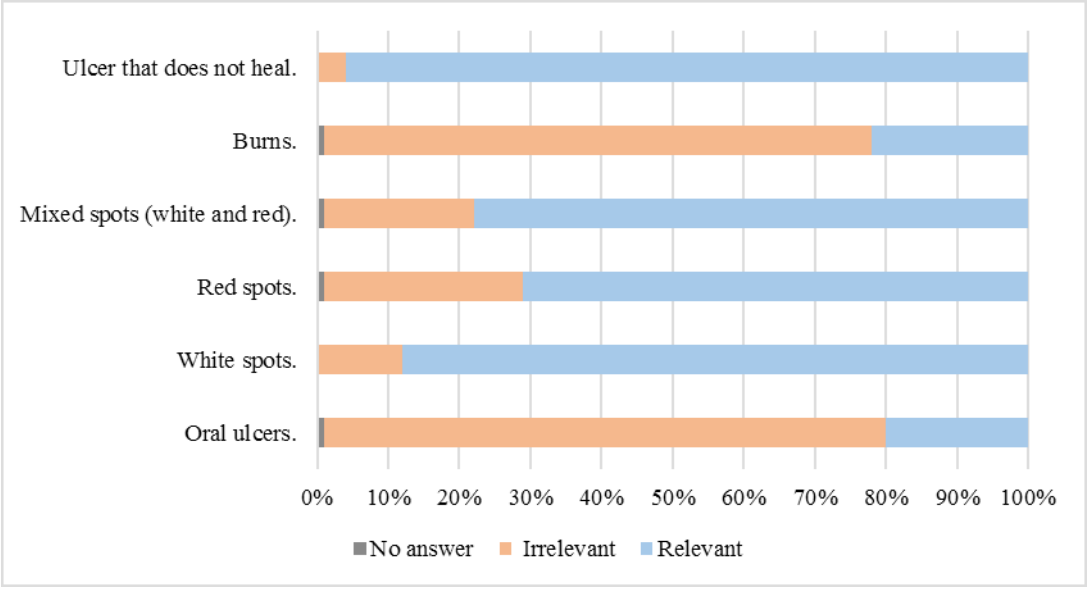

Figure 8: Bar chart illustrating the students' knowledge of oral cavity lesions that would prompt university students to seek dental consultation due to their perceived association with oral cancer.

Among the presented lesions, oral ulcers (76/96, 79.2%) and burns (74/96, 78.7%) were identified as the least relevant by the participants.

Salivary diagnostics

The study revealed a positive salivary HPV test result in 4.6% (5/108) of the participants in the study population.

Discussion

The etiology of oral cancer is complex, influenced by a combination of genetic, environmental, and lifestyle factors [29]. In this context, health literacy plays a vital role in empowering individuals to make informed decisions about their health, effectively manage their well-being, and be knowledgeable about strategies that mitigate disease risk factors [5].

The prevalence of HPV vaccination varies among different developed countries. When compared to other university populations, the vaccination rate found in this study was higher [30] and similar [31] to other recent studies. However, the prevalence of HPV infection, at 4.6%, was substantially lower than reported in various female university populations [32-36]. In January 2009, a national Prophylactic HPV vaccination campaign was initiated for Portuguese girls born from 1992 onwards. Therefore, the low prevalence found in this study can be attributed to the fact that the sample predominantly consisted of individuals already included in this campaign, suggesting a true efficacy of the immunization strategy in Portugal.

Although limited research exists on alcohol consumption among university students, our sample indicates that while the majority acknowledge consuming alcohol (70%), their intake revealed to be lower (69% declared to drink less than once a month), compared to the reported rates [37-38]. The inclusion of student workers in our study resulted in a slightly older age distribution compared to the majority of university populations examined [30,37,39,40]. Additionally, the identification of marital status revealed that 38% of the participants were married or cohabiting. In this social context, certain motivators for alcohol consumption, such as external positive reinforcement [41], may carry less significance, potentially explaining the reduced prevalence of alcohol consumption among this group.

The prevalence rates of non-smokers among university students (24%) are comparable to those reported in other studies conducted on university populations [39,42].

The practice of oral sex appears to be widespread among sexually active adolescents and adults, as supported by previous research [43]. This finding is further reinforced by our study, where 61% of the participants reported engaging in oral sex.

In terms of HPV knowledge, it is worth noting that a significant proportion of the students (76%) were unaware that HPV can be transmitted through saliva [44]. While salivary contact alone is not considered a primary mode of Human Papillomavirus (HPV) transmission, it is important to acknowledge that HPV can potentially be present in saliva, especially in cases where an individual has an active HPV infection in the oral or oropharyngeal area (mouth and throat) [44,45].

The study revealed that a substantial proportion of students (70%) do not link "Sexual activity at an early age" to an elevated risk of HPV transmission. However, it is well-documented in the literature that certain factors contribute to the facilitation of HPV transmission through early sexual activity. These factors include the increased vulnerability of the cervix in young females and a higher number of lifetime sexual partners [36,46-48].

Another aspect that revealed limited knowledge is the association between "Having other sexually transmitted diseases" and increased transmission risk (59% of incorrect answers). In reality, several factors contribute to this heightened risk, including: i) immunological effects once some sexually transmitted diseases (STDs) can impair the immune system or cause inflammation in the genital area, creating a more favorable environment for HPV to establish an infection; ii) genital lesions: certain STDs, such as genital herpes or syphilis, can cause open sores or lesions in the genital area - these lesions serve as entry points for HPV, thereby increasing the risk of transmission; iii) shared risk behaviors: engaging in high-risk sexual behaviors, such as having multiple sexual partners or participating in unprotected sex, can escalate the likelihood of acquiring both HPV and other STDs [49,50].

When examining the hypothesis that "HPV has visible symptoms or signs," it was found that 35% of the students acknowledged this belief. However, in reality, the majority of HPV infections are asymptomatic, meaning that individuals may not experience any noticeable signs or symptoms [45]. This concept is crucial to understand as it challenges the false notion of relying solely on visible symptoms for protection or surveillance [45,51].

It was observed that the majority of students (61%) did not relate sun exposure with oral cancer. Indeed, certain parts of the oral cavity, such as the tongue, floor of the mouth, or throat, are not directly affected by the risk of oral cancer due to sun exposure. However, it is worth noting that excessive and prolonged exposure to ultraviolet (UV) radiation from the sun can increase the risk of developing cancer in more susceptible areas, particularly the lips [52]. The harmful effects of UV radiation on the lips can be attributed to several factors. Firstly, UV radiation damages the DNA within cells, leading to genetic mutations that disrupt the normal control of cell growth and division and development of cancerous cells can potentially occur. Additionally, UV radiation can generate reactive oxygen species (ROS) within the cells - prolonged exposure to UV radiation can overwhelm the body's natural defense mechanisms against oxidative stress, causing cellular damage and further increasing the risk of cancer development [52,53].

The perception among the majority of students (96%) that "Oral cancer with HPV etiology affects more women than men" is not consistent with scientific findings. Research studies have consistently shown that HPV-associated oral cancers are more prevalent in men, specifically in the oropharyngeal region encompassing the back of the throat, tonsils, and base of the tongue. The higher incidence in men can be attributed to differences in HPV exposure and immune response between genders. This misconception needs to be addressed and clarified through targeted information campaigns to ensure accurate knowledge among the population [53-57].

A notable percentage of the participants (48%) did not associate traumatic injuries with the risk of oral cancer. However, it is important to note that trauma or chronic irritation to the oral tissues can contribute to the development of oral lesions, which may include non-cancerous conditions like ulcers and inflammatory changes. These conditions can create a prolonged state of inflammation, which is considered a favorable environment for their progression towards cancerous transformation [58].

When considering self-examination of the oral cavity, it is noteworthy that 19% of the women interviewed considered the observation of "gums" as irrelevant. Additionally, 79% and 77% of the participants did not consider "oral ulcers" and "burns," respectively, as justifications for visiting a dentist. However, self-examination of the oral cavity holds significant importance for the early detection of oral cancer as it empowers individuals to actively participate in their oral health. This heightened awareness enables individuals to identify potential abnormalities at an early stage, seek prompt medical attention, and improve their chances of successful treatment outcomes [59-61].

Conclusion

The findings of the present study emphasize the importance of enhancing oral health and oncology literacy among students. The results provide valuable insights into previously unidentified areas of misconception and knowledge gaps. By addressing these specific areas, targeted intervention plans can be developed to improve the understanding and dissemination of crucial concepts. Given that oral cancer prevention relies on knowledge of risk factors, it is essential to implement intervention plans not only for students but also for individuals who may not have easy access to reliable information. With the information obtained, intervention strategies can be customized to effectively transmit the necessary knowledge and raise greater awareness in the population.

Disclosures: The authors declare no conflicts of interest.

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